

REMARKS

Claims 1-11, 13-17, 19, and 21-29 remain in this application after entry of this amendment. Claims 18 and 20 were cancelled. Claims 1, 5, 6, 9, 11-14, and 28 have were amended herein.

Applicant appreciates the Examiner's indication that claims 1-5 and 28 are allowed.

Claim 1 was amended to correct a typographical error. More particularly, the word "signed" was amended to "signal".

Claim 19 was re-written in independent form by including the recitations of claim 18 upon which it previously depended.

Claim 28 was amended to correct a typographical error. More particularly, it was made to depend on claim 27 rather than claim 1.

Claims 5-27 and 29 were rejected as being unpatentable over Rutledge et al. (EP0866581, hereinafter "Rutledge") and Mazurenko et al. (Spectral coding for secure optical communications using refractive index dispersion, Optical Communications 133 (1997) 87-92, hereinafter "Mazurenko"). Applicant disagrees as there is not teaching, suggestion, or motivation to combine the references as proposed in the Office Action, and any such combination does not teach, suggest, or motivate all the recitations of any of the rejected claims.

The rejection of claims 5-27 and 29 appears to duplicate those of the previous Office Action. Although those rejections were addressed in Applicant's response to the previous Office Action, the current Office Action appears to disregard a majority of the arguments presented, and does so after mischaracterizing a portion of Applicant's response.

Applicant does not, as the Office Action asserts, argue that the prior art devices of Rutledge and Mazurenko are not physically combinable. Instead, Applicant argues that the Office Action fails to establish a prima facie case of obviousness because: (a) there is no teaching or suggestion to combine the references in the manner asserted in the Office Action, and, even if there were such a teaching or suggestion, (b) the resultant combination does not teach, suggest, or motivate all

the recitations of the rejected claims. If a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. [M.P.E.P. §2143.01 *citing* In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).] If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. [M.P.E.P. §2143.01 *citing* In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)] To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. [M.P.E.P. §2143.03 *citing* In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).]

Despite the fact that there is no teaching or suggestion to combine the references in the manner asserted by the Office action, and that any resultant combination does not teach, suggest, or motivate all the recitations of the rejected claims, Applicant has chosen to make some amendments herein in the hopes doing so will result in consideration of all of Applicant's arguments, and in allowance of all the pending claims. Applicant reserves the right to prosecute the previous form of those claims at a later point in prosecution, and possibly in a subsequent application.

Claim 5 was amended to recite: "An encryption device comprising: a multi-functional integrated optics chip having a coherent light input, a message signal input, and a key signal input; a first optical path; and a second optical path; whereby light entering the coherent light input is split between the first and second optical paths; the message signal input modulates light split into the first optical path; and the key signal input modulates light split into the second optical path." Among other things, the cited references do not teach, suggest, or motivate an encryption device including a multi-functional integrated optics chip that splits light between first and second optical paths where a message signal input modulates light split into the first optical path, and a key signal input modulates light split into the second optical path. Although Rutledge does use splitter 302 to split light between two optical paths, it does so in its receiver 300 and does not modulate the light split into those paths using a message signal input and a key signal input. Instead, it utilizes sensors to de-modulate the light split between the paths.

Moreover, despite the assertion by the Office Action to the contrary, Mazurenko does not teach, suggest, or motivate the use of a multi-purpose integrated optics chip as claimed. In asserting that such an integrated chip is taught by Mazurenko, the Office Action cites a portion of the conclusion of Mazurenko that recites "integrated encoding/decoding dispersive systems". However, the use of the term "integrated" is used therein to mean that both the encoding and decoding systems utilize a common dispersion function for encoding and decoding. It does not teach an "integrated chip" as claimed wherein the recited elements are all part of the same chip.

As such, the cited references do not teach, suggest, or motivate all the recitations of claim 5, and claim 5 is patentable over the cited reference. Claims 6-11 are patentable at least because of their dependence on claim 5.

In regard to claim 7, it should also be noted that claim 7 recites in part: "a loop connected to the multi-functional integrated optics chip at the end of each path." The cited references do not, taken individually or in combination, teach, suggest, or motivate a chip having a loop connected at the end of each of at least two divergent paths. The Office Action asserts that this is taught by Mazurenko's suggesting an increase in key complexity by using additional other coherence modulation arrangements. However, adding loops to the ends of the paths does not constitute additional other coherence modulation arrangements, and does not result in an increase in key complexity. As such, all the claimed "loops" of claim 7 aren't taught, suggested, or motivated, and even if they were, there is no teaching, suggestion, or motivation to utilize them as claimed. Moreover, it is unclear how one would utilize loops as claimed without rendering Rutledge unsuitable for its intended purpose and/or without changing its principle of operation.

In regard to claim 8, it should also be noted that claim 8 recites in part: "wherein each end is mirrored." The cited references do not, taken individually or in combination, teach, suggest, or motivate a chip having at least two divergent paths with mirrored ends. The Office action asserts that this is suggested by mirror 306 of Rutledge, but that mirror is not a mirrored end of a divergent path within an integrated optics chip, and is definitely not the mirrored end of two divergent paths. As such, Rutledge does not teach, suggest, or motivate the claimed recitations, and the inadequacy of Rutledge is not overcome by Mazurenko.

In regard to claim 9, it should also be noted that claim 9 recites in part: "the first and second optical paths of the multi-functional integrated optics chip are divergent paths that meet at a convergent end " The Office Action asserts that this is taught by figure 1 of Rutledge and states "divergent beams from beam splitter eventually meeting." However, the beams split by splitter 302 of Rutledge are directed to, and terminate at, sensors/demodulators 304 and 308, and do not "eventually meet". As such, Rutledge does not satisfy the recitations of claim 9, nor is the inadequacy of Rutledge overcome by combining it with Mazurenko.

In regard to claim 11, it should also be noted that claim 11 recites in part: "the multi-functional integrated optics chip further comprises an encrypted message output through which light from the coherent light input split between the first and second optical paths and subsequently recombined exits the multi-functional integrated optics chip." The cited references do not, taken individually or in combination, teach, suggest, or motivate a multi-functional integrated optics chip having the specified output, particularly an output through which light split between optical paths and recombined exits the chip.

Claim 12 recites in part: "the message signal input modulates light split into the first optical path by reversibly altering the refractive index of the first optical path and the key signal input modulates light split into the second optical path by reversibly altering the refractive index of the second optical path." The Office Action asserts Mazurenko satisfies the recitations of claim 12. However, Mazurenko does not teach, suggest, or motivate dynamic modification by application of signals to inputs (i.e. reversibly altering the refractive index using the message and key signals). The method of coding discussed in Mazurenko involves the use of refractive index dispersion (not dynamic refractive index manipulation), and the use of dispersive plates. As such, although the refractive index varies in regard to wavelength, it is static in regard to signal and key content. Moreover, Mazurenko does not teach suggest or motivate modifying the refractive index of two separate paths.

Claim 13 was amended to include the recitation: "the encrypted message comprises light split from the coherent light source split between two parallel optical paths within the multi-functional integrated optics chip and subsequently recombined to form the encrypted message." As

previously discussed, the cited references do not, taken individually or in combination, teach, suggest, or motivate an integrated optics chip, nor do they teach, suggest, or motivate a device comprising such a chip. This is particularly true when the optics chip must comprise the specified inputs, outputs, and divergent paths, and must produce an encrypted message in response to signal generator inputs in order to satisfy the recitations of claim 13. It is especially true when the encrypted message output by such a chip must comprise light split from the coherent light source split between two parallel optical paths within the multi-functional integrated optics chip and subsequently recombined to form the encrypted message.

As such, the cited references do not teach, suggest, or motivate all the recitations of claim 13, and claim 13 is patentable over the cited reference. Claims 14-17 are patentable at least because of their dependence on claim 13.

In regard to claim 14, it should also be noted that claim 14 recites in part: "the message signal input is connected to one path of the two parallel optical paths and can reversibly alter the refractive index of the path to which it is connected and the key signal input is connected to the other path of the two parallel optical paths and can reversibly alter the refractive index of the path to which it is connected." The Office Action asserts Mazurenko satisfies the recitations of claim 14. However, Mazurenko does not teach, suggest, or motivate dynamic modification by application of signals to inputs. The method of coding discussed in Mazurenko involves the use of refractive index dispersion (not dynamic refractive index manipulation), and the use of dispersive plates. As such, although the refractive index varies in regard to wavelength, it is static in regard to signal and key content. Moreover, Mazurenko does not teach suggest or motivate modifying the refractive index of two separate paths.

In regard to claim 19, the cited references do not teach, suggest, or motivate an encryption device wherein the means for producing "exclusive or" functionality comprises means for dividing the coherent light signal into two divergent paths with mirrored ends and means for altering a refractive index of the paths...." Applicant respectfully points out that the beam splitter 302 and mirror 306 which the Office Action relies on as satisfying the recitations of claim 19 are positioned after the modulators 204 and 208. As such, the divergent paths followed after the

beam splitter 302 splits the light signal do not have their refractive indexes altered. Moreover, the divergent paths followed after the beam splitter 302 splits the light signal do not have mirrored ends. As such, claim 19 is patentable over the cited references at least because they fail to teach, suggest, or motivate all the recitations of claim 19, as is claim 21 at least because of its dependence on claim 19.

Claim 22 recites: "A method for encryption using interference from a coherent light source comprising the steps of: issuing a coherent light signal from a coherent light source to a multi-functional integrated optics chip; dividing the coherent light signal into two paths within the multi-functional integrated optics chip; issuing pre-determined signals to the two paths of the multi-functional integrated optic chip where a message signal input is attached to one path of the multi-functional integrated optics chip and a key signal input is attached to the other path; recombining the divided light signal to create an encrypted signal; and, outputting the encrypted signal via an encrypted message output." The Office Action asserts that the "dual modulation" of Rutledge satisfies the recitations of dividing the coherent light signal into two paths, issuing signals to the paths, and recombining the divided light signal. However, it is readily apparent from the text and figures of Rutledge that light carried by fiber 206 is modulated in phase modulator 204 and then carried on fiber 210 and modulated in OOK modulator 208. The light is not split between the modulators, but instead passes through them sequentially. The fact that the beam is not split seems to have been seen but not appreciated in the Office Action as it describes the cited portions of Rutledge as describing dual modulation of a beam rather than modulation of two separate beams. This inadequacy of Rutledge in regard to the recitations of claim 22 are not overcome by Mazurenko. Moreover, since the cited references do not teach, suggest or motivate splitting the light, they also do not teach, suggest, or motivate issuing signals to paths for each portion of the divided signal, and/or recombining the split portions of the light signal. As such, the cited references, individually or in combination, do not teach, suggest or motivate the recitations of claim 22. As such, claim 22 is patentable over the cited references, as are claims 22-25 at least because of their dependence on claim 22.

In regard to claim 23, it should also be noted that claim 23 recites in part: "the message signal input and key signal input reversibly alter the refractive index of the path to which each input is connected." As previously discussed, the cited references, individually or in combination, do not teach, suggest, or motivate reversibly altering the refractive index of any path. As such, claim 23 is patentable over the cited references for this reason in addition to being patentable by virtue of its dependence on claim 22.

Claim 26 is patentable for reasons similar to those for claim 22, i.e. the cited references do not individually or in combination teach, suggest, or motivate "dividing the coherent light signal into two paths within the multi-functional integrated optics chip" and "recombining the divided light signal to create a message signal" as claimed. Moreover, as the only basis the Office Action gives for rejecting claim 26 is that the claimed features are well known in the art for the motivation of providing secure communication, Applicant respectfully requests that if the rejection of claim 26 is maintained in a subsequent Office Action that such an Office Action provide an example of such a "well known" method.

Claim 27 was also rejected as being unpatentable over Rutledge and Mazurenko. However, the cited references do not teach, suggest, or motivate an apparatus "that produces an optical signal encoded with an encrypted message by splitting coherent light into a first optical signal and a second optical signal, encoding the first optical signal with a message to be encrypted, encoding the second optical signal with a key, and combining the first and second optical signals to produce the optical signal encoded with an encrypted message." The Office Action asserts that the claimed apparatus is "well known in the art for the motivation of providing secure communications." Applicant respectfully disagrees, and requests that, if the rejection is maintained in a subsequent Office Action, that such an Office Action provide an example of such a "well known" apparatus. Rutledge and Mazurenko, taken individually or in combination, do not teach, suggest, or motivate an apparatus as claimed. Specifically, they do not teach suggest or motivate splitting coherent light into first and second optical signals, encoding the signals, and then recombining the signals as claimed. As such, claim 27 is patentable over the cited references. Claim 28 is patentable at least because of its dependence on claim 27.

Claim 29 was also rejected as being unpatentable over Rutledge and Mazurenko, and Applicant once again respectfully disagrees as the cited references do not, individually or in combination, teach, suggest, or motivate all of the recitations of claim 29. More particularly, the cited references do not teach, suggest, or motivate an apparatus as claimed wherein "the optical waveguide input, the first optical path, the second optical path, and optical waveguide output are optically coupled together such that light entering the apparatus via the optical waveguide input is split such that a first portion of the light follows the first optical path and a second portion of the light follows the second optical path." The Office Action asserts that the elements of claim 29 are found in the encryption and timing circuitry 100 and modulators 204 and 208 of figure 1 of Rutledge. However, light from laser 202 passes first into modulator 204, and then into modulator 208. The light from laser 202 is not split between the modulators. This deficiency is not made up by Mazurenko. As such, claims 29 is patentable over the cited references.

It is believed that the case is now in condition for allowance, and an early notification of the same is requested. If the Examiner believes that a telephone interview will help further the prosecution of this case, he is respectfully requested to contact the undersigned attorney at the listed telephone number.

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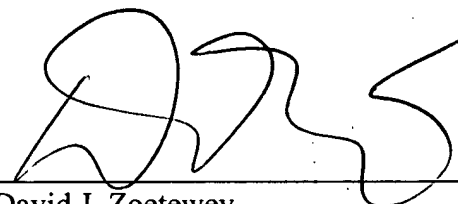
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Signature

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Very truly yours,

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